Kindly enter the following new claim:

21. The process according to claim 11 wherein the low-boiling organic part comprises sulfur-containing and/or nitrogen-containing organic compounds one or more of which are oxidized in the liquid reaction medium, and wherein the second separated liquid is an aqueous solution containing at least a portion of the oxidized sulfur-containing and/or nitrogen-containing organic compounds.

REMARKS

This Amendment is respectfully submitted to place rejected claims of subject Application in condition for allowance. In particular, Claim 3 has been canceled without prejudice, Claims 1, 12 to 15, inclusive, and 20, have been amended to more particularly point out and distinctly claim the subject matter of the invention, and new Claim 21 has been added.

As urged by Examiner, the term "high-boiling fraction" in Claim 15 has been amended to read "high-boiling part". Inadvertent typographical errors in Claims 14 and 20 have been corrected, and amended Claims 12 and 13 now refer to "the neutralizing agent" which is an aqueous solution of a chemical base in the form of carbonate or bicarbonate.

Claim 1 has been amended to recite the limitations of canceled Claim 3.

New Claim 21 is directed to the process according to Claim 11 wherein the low-boiling organic part comprises sulfur-containing and/or nitrogen-containing organic compounds one or more of which are oxidized in the liquid reaction medium, and wherein the second separated liquid is an aqueous solution containing at least a portion of the oxidized sulfur-containing and/or nitrogen-

containing organic compounds. Support for Claim 21 is found in the specification and original Claim 2.

In view of the amendments and remarks submitted above, it is the position of Applicants that instant Claims 1, 2, and 4 to 21, inclusive, meet all requirements of 35 U.S.C. § 112.

102 Rejections

In outstanding Office Action, Claims 1, 2, 5, and 8 were rejected under 35 U.S.C. § 102(b) as being anticipated by EP 0 252 606 (EP). Applicants respectfully traverse this rejection.

The EP reference of record is directed to a process for increasing the cetane number of a middle distillate fuel fraction, i.e., diesel fuel, by catalytic oxidation of benzylic carbon atoms in the fuel to ketones and, while not mentioned, thereby also forming acidic co-products. The presence of these acidic co-products makes the oxidized product of the EP process undesirable for diesel fuel. In fact, Applicants believe that these acidic compounds, such as phenolics, would tend to erode any gains on cetane number obtained by the catalytic oxidation as described in the EP reference.

By contrast, Applicants' multi-step, integrated process includes:

contacting a gaseous source of dioxygen with the organic feedstock in a liquid reaction medium containing a soluble catalyst system comprising at least one multi-valent and/or heavy metal while maintaining the liquid reaction medium substantially free of halogen and/or halogen-containing compounds, to form a mixture of immiscible phases comprising hydrocarbons, oxygenated organic compounds, water of reaction, and acidic co-products; and

recovering a product having a low content of acidic co-products obtained by contacting at least a portion of the separated organic liquid with a neutralizing agent.

Therefore, Applicants respectfully request Examiner to withdraw the rejection of Claims 1, 2, 5, and 8 based upon EP 0252606 under 35 U.S.C. § 102(b).

103 Rejections

In outstanding Office Action, Claims 4, 6, and 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over EP 0252606. Applicants respectfully traverse this rejection.

Several critical elements of Applicants' multi-step, integrated process are not disclosed or suggested by the EP reference of record. Such elements include (i) contacting at least a portion of the separated organic liquid with a neutralizing agent; and recovering a product having a low content of acidic co-products, (ii) recovering at least a portion of the catalyst system in active form from the separated second liquid; and injecting all or a portion of the recovered catalyst system into the liquid reaction medium; and where all or at least a portion of the organic feedstock is a product of a hydrotreating process to assist by hydrogenation removal of sulfur and/or nitrogen from the hydrotreated petroleum distillate, (iii) using hydrogenation catalyst which comprises at least one selected active metal in an amount of from about 0.1 percent to about 20 percent by weight of the total catalyst, or (iv) partitioning of the hydrotreated petroleum distillate by distillation to provide at least one low-boiling liquid consisting of a sulfur-lean, mono-aromatic-rich fraction, and a high-boiling liquid consisting of a sulfur-rich, mono-aromatic-lean fraction, and wherein the organic feedstock is predominantly the low-boiling liquid.

Furthermore, instant claims are directed to a novel, multi-step, integrated process which includes contacting a gaseous source of dioxygen with the organic feedstock in a liquid reaction medium containing a soluble catalyst system comprising at least one multi-valent and/or heavy metal while maintaining the liquid reaction medium substantially free of halogen and/or halogen-containing compounds. The EP reference of record does not disclose or suggest

maintaining the liquid reaction medium substantially free of halogen and/or halogen-containing compounds.

The EP reference of record states that prior to catalytic oxidation of benzylic carbon atoms in diesel fuel to form ketones, the fuel can be catalytically hydrotreated or hydrorefined in order to increase the number of benzylic carbon atoms present therein. According EP the amount of sulfur and nitrogen present in the fuel may be reduced by such hydrorefining, but not by the selective oxidation of benzylic carbon atoms to form ketones. See page 3, lines 14 to 17.

Applicants' oxidation process beneficially reduces both sulfur and nitrogen levels even where the refinery distillate feedstock has been by hydrotreated to remove sulfur. See Applicants' example 7 at page 44, lines 13 to 22. Analyses of oxygenated organic liquid in example 7 determined a sulfur reduction of 45 percent, a nitrogen reduction of 50 percent, and a total acid number of 7.1 mg KOH/g.

Therefore, Applicants respectfully request Examiner to withdraw the rejection of Claims 4, 6, and 7 based upon EP 0252606 under 35 U.S.C. § 103.

Claim 3 was rejected under 35 U.S.C. § 103(a) as being unpatentable over EP 0252606 in view of U.S. Patent No 2,365,220 in the name of Thomas H. Schultz, Irving E. Levine and Homer B. Wellman (Schultz et. al.).

While Claim 3 has been canceled, it is the position of Applicants that instant Claim 1, directed to their novel, multi-step, integrated process, meets all requirements of 35 U.S.C. § 103(a) and therefore is patentable over EP 0252606 in view of U.S. Patent No 2,365,220.

The EP reference is directed to catalytic oxidation of benzylic carbon atoms in diesel fuel to form ketones, where the term

"benzylic carbon atom" is a carbon atom directly bound to an aromatic ring, but which itself is not a part of an aromatic ring. See EP page 3, lines 39 and 40.

The Schultz et al. reference of record is directed a process said to enhance combustion characteristics of fuel in diesel motors. Schultz et al. describes partial oxidation of diesel fuels free from large proportions of aromatic ring compounds. See Schultz et al. claim 1 at page 7, lines 67 to 74.

Because fuels for the partial oxidation process according to Schultz et al. are **free** of compounds having benzylic carbon atoms for oxidation according to the EP process, Applicants believe that the combination of these references of record, as relied upon by Examiner, would be error.

Claims 9 and 10 were rejected under 35 U.S.C. § 103 (a) as being unpatentable over EP 0252606 in view of commonly assigned U.S. Patent No 3,150,172 in the name of Carl Serres, Jr. and Ellis K. Fields (Serres et. al.). Applicants respectfully traverse this rejection.

Commonly assigned Serres et. al. reference of record discloses reacting a reformate bottoms fraction in the liquid phase with molecular oxygen-containing gas in the presence of a catalyst comprising, **in conjoint presence, bromine** and heavy metal oxidation catalyst to form a naphthalene carboxylic acid (emphasis supplied). See col. 1, lines 52 to 60. Instant Claims 9 and 10 are directed to the process according to Claim 1 which includes the step of "contacting a gaseous source of dioxygen with the organic feedstock in a liquid reaction medium containing a soluble catalyst system comprising at least one multi-valent and/or heavy metal while maintaining the liquid reaction medium substantially free of halogen and/or halogen-containing compounds", i.e., without bromine. The combination of the process described in the EP reference and Serres et. al. catalyst system requiring a conjoint

presence of bromine and heavy metal, does not result in Applicants' novel process using a liquid reaction medium substantially free of halogen and/or halogen-containing compounds.

It is the position of Applicants that the Serres et. al. reference of record is not pertinent to Applicants novel process wherein the liquid reaction medium is substantially free of halogen and/or halogen-containing compounds.

Therefore, Applicants respectfully request Examiner to withdraw his rejection of instant Claims 9 and 10 based upon Serres et. al. in the combination with EP 0252606.

Claims 11 to 14 were rejected under 35 U.S.C. § 103 (a) as being unpatentable over EP 0252606 in view of U.S. Patent No 2,365,220 in the name of Thomas H. Schultz, Irving E. Levine and Homer B. Wellman (Schultz et. al.). Applicants respectfully traverse this rejection.

Schultz et al. describes partial oxidation of diesel fuels **free** from large proportions of aromatic ring compounds. See Schultz et. al. claim 1 at page 7, lines 67 to 74.

By contrast Applicants' Claim 11 recites an integrated process which includes partitioning by distillation an organic feedstock to provide at least one low-boiling organic part consisting of a sulfur-lean, **mono-aromatic-rich** fraction, and a high-boiling organic part consisting of a sulfur-rich, mono-aromatic-lean fraction. The instant partitioning step must at once achieve these several objectives. Such multi-objective partitioning is not disclosed or suggested by either EP 0252606 or Schultz et. al. separately or in combination as applied by Examiner.

Amended Claims 12 to 14, inclusive, are dependent from new Claim 21 which is directed to Applicants' novel process according to claim 11 wherein the low-boiling organic part comprises sulfur-

containing and/or nitrogen-containing organic compounds one or more of which are oxidized in the liquid reaction medium, and wherein the second separated liquid is an aqueous solution containing at least a portion of the oxidized sulfur-containing and/or nitrogen-containing organic compounds.

The Schultz et. al. reference of record does not disclose or suggest that any liquid separated from the blown oil is an aqueous solution containing at least a portion of oxidized sulfur-containing and/or nitrogen-containing organic compounds.

According to Schultz et al. the air oxidation is carried out in the presence of calcium naphthenate in an amount such that proportion of the salt is 1.0 %be weight. By washing the blown oil with water, in which the calcium salts or soaps of moderately strong organic acids are suspended or dissolved, and hence removed from the oil. Such strong acids as are present in the oil are then removed by scrubbing with caustic soda solution. See Schultz et al. page 2, left col., lines 4 to 40.

At most the Schultz reference mentions that such strong acids as are present in the blown oil after washing with water are then removed by scrubbing with caustic soda solution. See Schultz et al. page 2, left col., lines 4 to 40.

Instant Claim 12 is directed to the process according to claim 21 wherein the neutralizing agent is an aqueous solution of a chemical base in the form of carbonate or bicarbonate, and the recovered oxygenated product exhibits a total acid number of less than about 20 mg KOH/g.

Instant Claim 13 is directed to the process according to claim 21 wherein the neutralizing agent is an aqueous solution of a compound selected from the group consisting of sodium, potassium, barium, calcium and magnesium in the form of carbonate or bicarbonate, and

the recovered oxygenated product exhibits a total acid number of less than about 20 mg KOH/g.

Instant Claim 14 is directed to the process according to claim 21 wherein all or at least a portion of the organic feedstock is a product of a process for hydrogenation to assist by hydrogenation removal of sulfur and/or nitrogen from the hydrotreated petroleum distillate.

Therefore, Applicants respectfully request Examiner to withdraw the rejection under 35 U.S.C. § 103(a) of Claims 11 to 14 based upon EP 0 252 606 in combination with Schultz et. al.

Double Patenting

In outstanding Office Action, Claims 1 to 20 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 to 20 of copending Application No. 09/779,286 in the names of Gary P. Hagen, George A. Huff Jr., William A. Gong, ad Monica R. Regalbuto (Hagen et. al.) in view of EP 0252606.

In order to place subject application in condition for prompt allowance, there is provided herewith an appropriate terminal disclaimer which fully complies with 37 CFR 1.321(c) and 37 CFR 3.73(b), thereby overcoming this provisional obviousness-type double patenting rejection.

Applicants agree with Examiner that the references of record but not applied do not disclose or suggest Applicant's novel subject matter which includes, for example,

(i) partitioning by distillation an organic feedstock comprising a mixture of organic compounds derived from natural petroleum, the mixture having a gravity ranging from about 10° API to about 100° API to provide at least one low-boiling organic part consisting of a sulfur-lean, mono-aromatic-rich fraction, and a high-boiling organic part consisting of a sulfur-rich, mono-aromatic-lean fraction;

(ii) contacting a gaseous source of dioxygen with at least a portion of the low-boiling organic part in a liquid reaction medium containing a soluble catalyst system comprising a source of at least one catalyst metal selected from the group consisting of manganese, cobalt, nickel, chromium, vanadium, molybdenum, tungsten, tin, cerium, or mixture thereof, while maintaining the liquid reaction medium substantially free of halogen and/or halogen-containing compounds, to form a mixture of immiscible phases comprising hydrocarbons, oxygenated organic compounds, water of reaction, and acidic co-products;

(iii) separating from the mixture of immiscible phases at least a first organic liquid of low density comprising hydrocarbons, oxygenated organic compounds and acidic co-products and second liquid of high density which contains at least portions of the catalyst metal, water of reaction and acidic co-products; and

(vi) contacting all or a portion of the separated organic liquid with a neutralizing agent thereby recovering a low-boiling oxygenated product having a low content of acidic co-products.

Applicants urge that Claims 1, 2, and 4 to 21 inclusive, all claims now presented, are in condition for allowance. Applicants respectfully request Examiner Griffin to pass subject application for allowance.

Do not hesitate to contact Frederick S. Jerome whose telephone number is (630) 832-7974 (FAX (630) 832-7976) if additional assistance is needed regarding this paper or earlier papers for Applicants.

Applicants and their undersigned Attorney appreciate Examiner's attention and further consideration of this matter.

Respectfully submitted,

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Version of Amended Claims with Markings to Show Changes Made

1. (Once amended) A process for the production of refinery transportation fuel or blending components for refinery transportation fuel, which process comprises:

providing organic feedstock comprising a mixture of organic compounds derived from natural petroleum, the mixture having a gravity ranging from about 10° API to about 100° API;

contacting a gaseous source of dioxygen with the organic feedstock in a liquid reaction medium containing a soluble catalyst system comprising at least one multi-valent and/or heavy metal while maintaining the liquid reaction medium substantially free of halogen and/or halogen-containing compounds, to form a mixture of immiscible phases comprising hydrocarbons, oxygenated organic compounds, water of reaction, and acidic co-products; [and]

separating from the mixture of immiscible phases at least a first organic liquid of low density comprising hydrocarbons, oxygenated organic compounds and acidic co-products, and second liquid of high density which contains at least portions of the catalyst metal, water of reaction and acidic co-products ;

contacting at least a portion of the separated organic liquid with a neutralizing agent; and

recovering a product having a low content of acidic co-products .

12. (Once amended) The process according to claim 21 [11] wherein [at least a portion of the separated organic liquid] the neutralizing agent is [contacted with] an aqueous solution of a chemical base in the form of carbonate or bicarbonate , and the recovered oxygenated product exhibits a total acid number of less than about 20 mg KOH/g.

13. (Once amended) The process according to claim 21 [12] wherein the [chemical base] neutralizing agent is an aqueous solution

of a compound selected from the group consisting of sodium, potassium, barium, calcium and magnesium in the form of [hydroxide,] carbonate or bicarbonate, and the recovered oxygenated product exhibits a total acid number of less than about 20 mg KOH/g.

14. (Once amended) The process according to claim 21 [11] wherein all or at least a [potion] portion of the organic feedstock is a product of a process for hydrogenation of a petroleum distillate consisting essentially of material boiling between about 50° C. and about 425° C. which hydrogenation process includes reacting the petroleum distillate with a source of hydrogen at hydrogenation conditions in the presence of a hydrogenation catalyst to assist by hydrogenation removal of sulfur and/or nitrogen from the hydrotreated petroleum distillate.

15. (Once amended) A process for the production of refinery transportation fuel or blending components for refinery transportation fuel, which process comprises:

partitioning by distillation an organic feedstock comprising a mixture of organic compounds derived from natural petroleum, the mixture consisting essentially of material boiling between about 75° C. and about 425° C. to provide at least one low-boiling organic part consisting of a sulfur-lean, mono-aromatic-rich fraction, and a high-boiling organic part consisting of a sulfur-rich, mono-aromatic-lean fraction;

contacting a gaseous source of dioxygen with at least a portion of the low-boiling organic part in a liquid reaction medium containing a soluble catalyst system comprising a source of at least one catalyst metal selected from the group consisting of manganese, cobalt, nickel, chromium, vanadium, molybdenum, tungsten, tin, cerium, or mixture thereof, while maintaining the liquid reaction medium substantially free of halogen and/or halogen-containing compounds, to form a mixture of immiscible phases comprising hydrocarbons, oxygenated organic compounds, water of reaction, and acidic co-products;

separating from the mixture of immiscible phases at least a first organic liquid of low density comprising hydrocarbons, oxygenated organic compounds and acidic co-products and second liquid of high density which contains at least portions of the catalyst metal, water of reaction and acidic co-products; and

contacting all or a portion of the separated organic liquid with a neutralizing agent and recovering a low-boiling oxygenated product having a low content of acidic co-products; and

contacting the high-boiling organic part with an immiscible phase comprising at least one organic peracid or precursors of organic peracid in a liquid reaction mixture maintained substantially free of catalytic active metals and/or active metal-containing compounds and under conditions suitable for oxidation of one or more of the sulfur-containing and/or nitrogen-containing organic compounds;

separating at least a portion of the immiscible peracid-containing phase from the oxidized phase of the reaction mixture; and

contacting the oxidized phase of the reaction mixture with a solid sorbent, an ion exchange resin, and/or a suitable immiscible liquid containing a solvent or a soluble basic chemical compound, to obtain a high-boiling product containing less sulfur and/or less nitrogen than the high-boiling part [fraction].

20. (Once amended) The process according to claim 15 wherein the oxidation feedstock is a high-boiling distillate fraction [consists] consisting essentially of material boiling between about 200° C. and about 425° C derived from hydrotreating of a refinery stream.